DATABASE INSTRUCTION FIND OWNER

BACKGROUND

1. Field of the Invention

This invention relates generally to computer systems and more particularly to an improved digital computer in the area of database operations.

2. Description of the Prior Art

Electronic computers have grown from first generation hardware characterized mainly by vacuum tubes, to second generation hardware characterized by transistors, to third generation hardware characterized, in the main, by integrated circuits. Along with these different generations of hardware there were different generations of software, wherein first generation software was characterized mainly by machine language, assemblers and subroutines, and second generation software was characterized by high level languages, monitors and micro-assemblers. Third generation software is characterized by operating systems, on-line real-time systems, multiprogramming systems, and database management systems.

First generation hardware in combination with first generation software, and also the second generation hardware in combination with second generation software were primarily oriented toward batch processing where jobs were executed primarily in serial fashion. Moreover, the third generation of hardware/software systems are also batch process oriented; however, because of the advent of multiprogramming, several jobs may be executed in parallel rather than serial, and permits the acceptance of input information for processing as it is generated.

The fourth generation system will typically be classified as a communication and control system capable of widely diversified processor applications, and will be stimulated primarily by transmitted data rather than by batch programs (i.e. system control will be established primarily by input rather than by operator action) wherein submission of information will generally be in real-time.

In the evolution of the above generations of computer systems, a major requirement was to develop effective methods for accessing the databases of the computer systems. In the development of system databases, the initial result was the growth of many different databases for each use. As a result of this growing number of databases, problems were encountered in excess storage requirements and in redundant data storage which aggravates the problem by having redundant data being updated at different times correctly in one spot and incorrectly in another spot. Steps were taken to correct these problems by integrating the many databases of a system into one single database. The Honeywell Integrated Data Store (IDS) was an example of a system designed to alleviate these problems. The Integrated Data Store was composed of one central database which could be used, for example, by the inventory control system, the internal auditing procedures and payroll procedures for accessing their relevant data in the database. In this central integrated database, there would be a single record describing information which was common to several functional needs. For instance, inventory control and internal auditing would access the number of a given part in the warehouse.

Effective techniques using integrated databases were evolved through continually improving software techniques. The set concept is a technique which allows access to records in the integrated database on the basis of relationships between records. A typical relationship would be, say, all of the employees in a particular department, such as the manufacturing department. The manufacturing department would be described by what would be called an owner record and the employees in the department would be described by what would be called member records. The set which describes a relationship such as membership in the department could then be accessed through the owner record, which allows the software to obtain all of the member records and thus, for instance, print out all of the employees in the department.

At this state of development the integrated data store had solved some of the pure data problems mentioned above, i.e. redundant data in different databases and the problem of updating multiple copies of records. The problem had been solved by one single record which therefore allowed a reduction in data storage size and a single copy of data. Other problems in using databases still remain in the performance areas. The set concepts represented new techniques of utilizing the computer and henceforth there were no specialized hardware instructions which existed on current central processors to aid these new techniques. As a result, a set operation like find the first member of the set would be implemented in the software through a series of standard machine instructions such as add, load, stores, etc. The result was a long execution time for the rather simple set operations of find first member, insert a record in a set, and the other set operations.

What was needed was a database system which both solved the traditional data problems as had already been solved in the integrated data techniques using set operations and also an efficient database system in terms of execution time and other system performance parameters. To effect this specialized hardware/firmware supported instructions were needed to assist in the set operations. For instance, a single instruction to a database address of a member record's owner record (member and owner records described infra) in a register would allow execution in a much smaller period of time than the series of 5 to 10 extended machine instructions to perform the same operation in a traditional machine.

OBJECTS OF THE INVENTION

It is a primary object of the invention to provide an improved general purpose digital computer.

It is another object of the invention to provide an improved general purpose digital computer having improved performance of database management operations.

It is still a further object of the invention to provide a hardware/firmware instruction that loads the database address of a member record's owner record into a register or registers.

It is still a further object of the invention to reduce the number of instructions in user and operating system programs.

SUMMARY OF THE INVENTION

The foregoing objects are achieved according to one embodiment of the invention by providing one of a series of hardware/firmware implemented instructions